Pelletixia amelguita, a New Species of Fossil Fern in the Potomac Group (Lower Cretaceous)

JUDITH E. SKOG*

A new species of the fossil fern *Pelletixia* Watson and Hill (1982) has been identified from fragments of pinnules discovered in sediments belonging to the Lower Cretaceous Potomac Group of Maryland. The locality was exposed in a stream bank at high flood stage during a tropical storm in 1972. Subsequently, material was collected from the site for several years until erosion by the stream completely destroyed the locality. The material described here is placed in a genus previously known only from the Wealden beds (Lower Cretaceous) of England. The Potomac Group and Wealden Formation have been shown to have many plants in common (Hueber, 1982), and so it is not surprising to find an additional example of a genus reported only from these two localities.

Locality and Stratigraphy.—*Pelletixia amelguita* was isolated as pinnule fragments from material brought to the U. S. National Museum of Natural History by Mr. Howard Hruschka. He had collected the material from a high, newly eroded bank along Paint Branch about one mile north of the University of Maryland campus in College Park, Maryland (Washington East Quadrangle 7.5 minute series topographic sheet, 39°00′ W lat., 76°56′ N long.). The plant-bearing strata are in Zone 1 of the Potomac as defined by Doyle (1969) and are probably of Barremian–Aptian age within the Lower Cretaceous. The stratum whence came the specimens described herein is probably the same which produced the rhizome of the fern *Loxsomopteris anasilla* J. Skog (1976). The age of the specimens is approximately 130 million years.

Materials and Methods.—The clay matrix was bulk macerated in 48% hydrofluoric acid. The residue was thoroughly washed with several changes of water until acid-free, sieved, and then sorted under a dissecting microscope for all sizes of material (Hueber, 1982). The specimens were examined under a Wild M-5 dissecting microscope, photographed, and then drawn using a camera lucida attachment. One specimen was air dried and mounted on the surface of a 12 mm cover glass that had been thinly coated with white glue. The cover glass was attached to a SEM stub with silver paint, coated with gold-palladium, and observed with a JOEL JSM-35C scanning electron microscope at the Palynology Laboratory, United States Geological Survey, Reston, Virginia. The specimen was cracked open on the stub and recoated to release some spores after the first viewing indicated the presence of sporangia and spores. Unfortunately, the inclusion of thymol granules in the water used for separating material did not prevent the second specimen from being destroyed by bacteria and fungi. This problem has also been noted by Hueber (1982) for material of the same age from a different locality. Photographs were taken with a Wild M-5 dissecting scope with 35mm camera attachment using Kodak Plus-X Pan film or with the SEM using Polaroid Type 52 positive-negative film.

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*Department of Biology, George Mason University, Fairfax, VA 22030.

FIG. 1. Pinnules of *Pelletixia amelguita*, ×26. FIG. 2. Pinnule of *Pelletixia amelguita*. Type specimen USNM 326733, ×52. The abbreviations are: l = lobe, m = matrix, mr = midrib, s = stalk.

Pelletixia amelguita J. E. Skog, sp. nov. (Schizaeaceae) **Figs. 1–12.**

The fragments isolated from the matrix represent two tightly enrolled pinnules 1.5 to 2.5 mm long on short stalks 0.5 mm or less long (*Figs. 1* and *2*). The specimens are fractured, probably due to shrinkage as the matrix dried out in the laboratory (*Figs. 2* and *3*). Ridges and clay-filled grooves can be seen on both specimens and

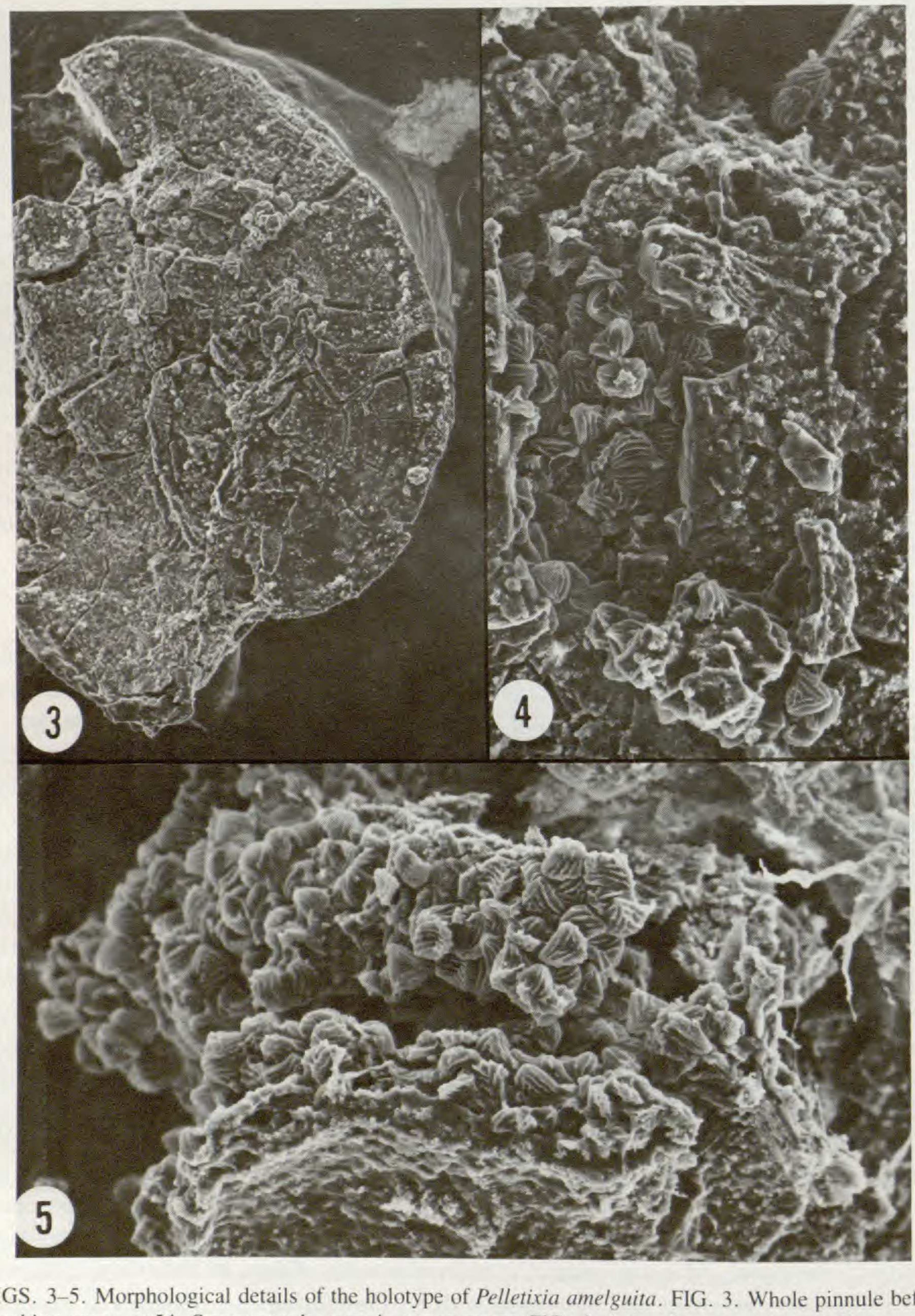
may represent veins or lobes of the pinnule. Such detail would be better defined were the pinnules unrolled. A definite midrib is seen along the adaxial surface of the pinnules (*Fig. 3*). Only one specimen (*Fig. 2*) remained for further study after general handling while studying; the additional characters described here are based on that specimen alone. When first viewed with the scanning electron microscope, the pinnule was clearly seen to be fertile (*Figs. 4* and *5*). The epidermis shows few cellular details other than it is composed of smooth, even cells. The sporangia were broken when the specimen was dissected, with the result that no details of the annulus can be described. Remnants of what may be an annulus can be seen in *Figs. 4* and *8*. At least 120 (128) spores can be counted in one area (*Fig. 5*), probably derived from a single sporangium. The spores are well-preserved and distinctive. They are trilete (*Fig. 6*), about 28–35 μm in diameter, and have raised lips around the laesura which seem to extend into a ridge that extends to the margin of the spore (*Fig. 7*). The spores are triangular with the margins at times slightly convex and the apices somewhat rounded. Two or three muri parallel the margins of the spore on both the proximal and distal surfaces (*Figs. 6* and *8*). These muri are narrow, 0.5–2 μm wide, 1–2 μm high and are separated by spaces 1.5–3.5 μm wide. On the distal surface the muri join at the pole to form a triangle about 5.0 μm in diameter. The shape of the triangular area is variable, ranging from sharply triangular (*Figs. 8* and *9*) to subdivided (*Figs. 10* and *11*), to circular within a triangle (*Fig. 12*). The outer muri extend to the apices.

TYPE: USNM 326733, Paleobotany Collections, U. S. National Museum of Natural History.

TYPE LOCALITY: East bank of Paint Branch, College Park, MD, U.S.A. Washington East Quadrangle 7.5 minute series, 39°00′ Lat. 76°56′ Long. Stratigraphy: Patuxent Formation, Potomac Group, Barremian–Aptian, Lower Cretaceous.

SPECIES NAME: Derived from the Spanish diminuitive of "amelga" meaning a ridge between valleys—to emphasize the smaller muri on the spores of this species in contrast to the spores of *Pelletixia valdensis* (Seward) Watson & Hill.

Seward (1913) described fertile pinnae or fronds from the Wealden (Lower Cretaceous) in England which he named *Pelletieria valdensis*. *Pelletieria* Seward, 1913, was shown by Watson and Hill (1982) to be a later homonym of *Pelletiera* St.-Hilaire, 1822, a member of the Primulaceae. They proposed the new generic name *Pelletixia* and formed the new combination *Pelletixia valdensis* for the monotypic species. Watson (1969) restudied Seward's type specimen for the species and determined that the fronds were quadripinnate, comprising slender axes without laminae. The fertile pinnules were tightly enrolled in this genus and there was little sterile tissue associated with the clusters of sporangia. The specimen discovered in the Potomac Group and described here exhibits the form of pinnule identical to the generitype. It is identified with the genus even though details of the morphology of the frond are not known for the new material. No other ferns of this age have been described with these very tightly revolute fertile pinnules. The spores of both species belong to the dispersed spore genus *Cicatricosisporites*. Those of *Pelletixia valdensis* have been well described and identified with *C. brevilaesuratus* (Hughes & Moody-Stuart, 1966). The spores of *P. amelguita* are closest in details of size and morphology to the dispersed spore species *Cicatricosisporites aralica* (Bolkhovitina) Brenner (see Brenner, 1963, Plate 7, fig. 4, 5; Phillips & Felix, 1971, Plate I, fig. 16). Brenner commented that these spores are similar to those in the fossil fern *Ruffordia goeppertii* Seward and that they occur commonly in Zone I of the Potomac



FIGS. 3–5. Morphological details of the holotype of *Pelletixia amelguita*. FIG. 3. Whole pinnule before breaking apart, ×54. Spores can be seen in upper center. FIG. 4. Area of spores enlarged. Remnant of sporangial wall and annulus can be seen at top center of photograph, ×200. FIG. 5. Area of spores after further breaking of specimen. Approximately 120 spores can be counted, ×200.

Group and are very common in the Wealden of England. He noted that similar spores are produced by extant species of *Anemia*. Both Hughes & Moody-Stuart (1966) and Watson (1969) commented that *C. brevilaesuratus*, the spore of *Pelletixia valdensis*, is comparable to the spores of *Ruffordia goeppertii*. The spores of *P. amelguita* are smaller than those of *P. valdensis*, actually about half the size, and the ridges are widely spaced, whereas in *P. valdensis* the ridges are quite close together. The spores of *P. amelguita* are certainly more similar to those of some specimens of *Ruffordia goeppertii* in size and spacing of muri, especially as described by Watson for specimen V 2192 of *R. goeppertii*. However, no specimen of *R. goeppertii* has been described with the tightly revolute pinnules of *Pelletixia*.

Thus, while the newly described pinnules are placed in the genus *Pelletixia*, I suggest that the genus may actually represent a stage in the development of the fertile frond. The open (unrolled), dispersing stage of the pinnules has been described and identified as a specimen of *Ruffordia goeppertii*. There is support for this interpretation within the modern genus *Anemia*. In modern affinities the fossil plants most closely resemble the genus *Anemia*, particularly plants found in the subgenus *Anemiorhiza*. *Anemia aurita* Swartz (endemic to Jamaica) has fertile pinnules that are at first tightly rolled and then unroll somewhat to release the spores (Mickel, 1981). The spores of this species and others within the subgenus resemble those of *Pelletixia* and also *Ruffordia*. Mickel (1981) considers this subgenus to be the most primitive of the genus.

The interpretation of the habitat of *Pelletixia* has been uncertain. Seward (1913) suggested it was possibly aquatic. Hughes and Moody-Stuart distinguished it from *Ceratopteris*, but suggested exploring the possibility that it was aquatic and not related to the rest of the family Schizaeaceae. Watson (1969) said that "the form of the fertile fronds cannot be matched" within the family Schizaeaceae and compared the structure of them to *Onoclea sensibilis* L. I suggest that there are comparable fertile pinnules within the Schizaeaceae, especially in tropical species of the genus *Anemia*, and that following further study, *Pelletixia*, *Ruffordia*, and *Anemia* may all prove to be congeneric.

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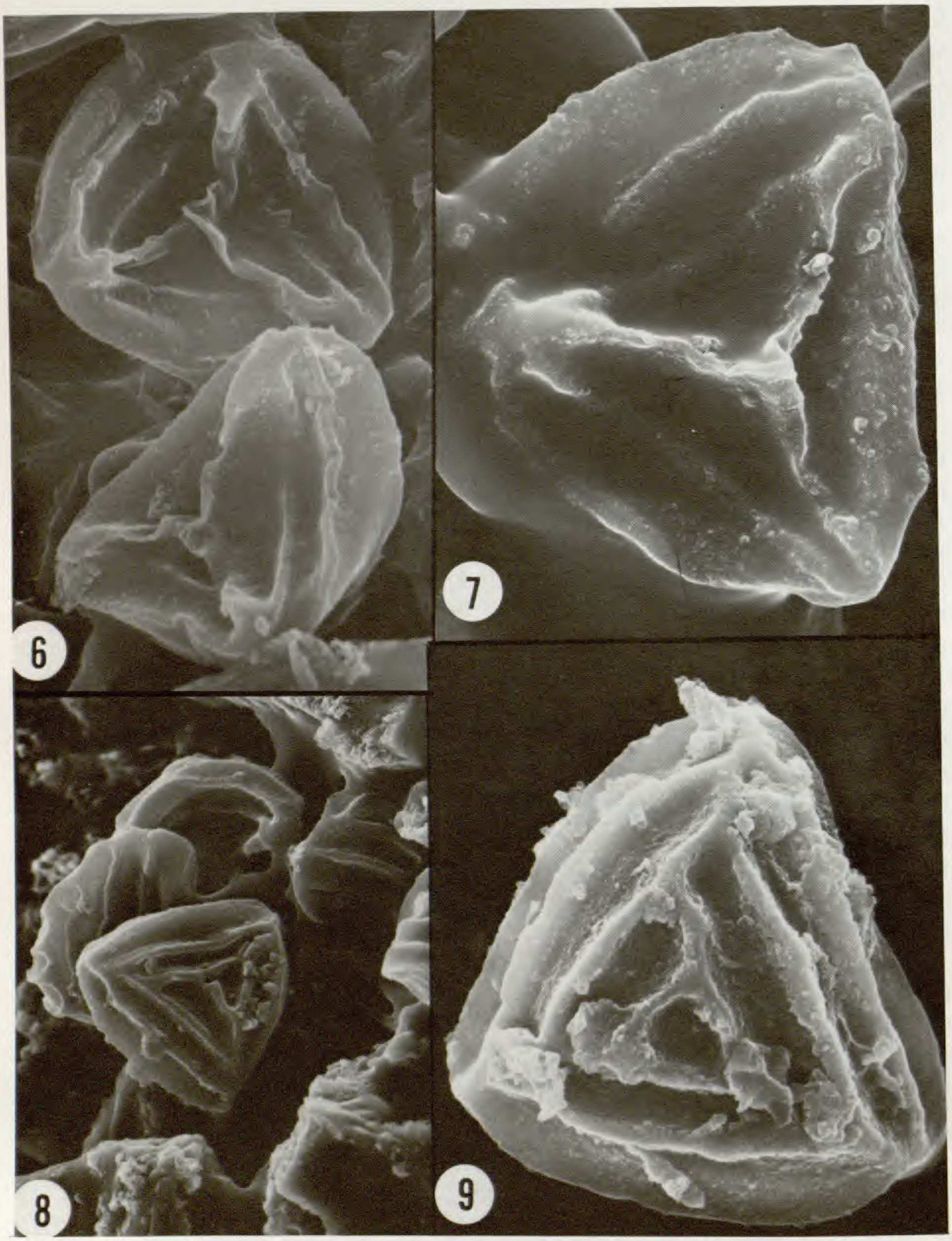
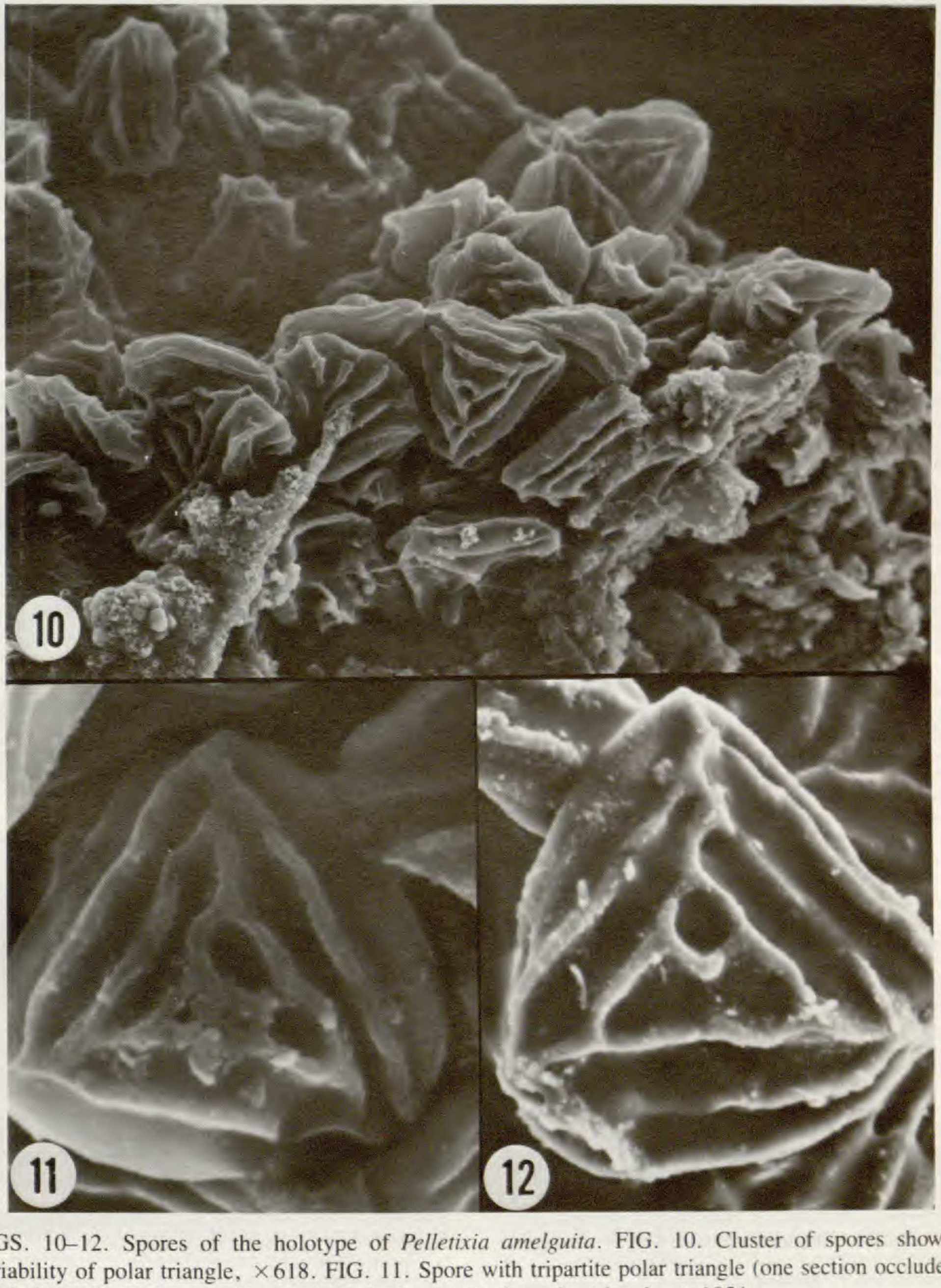


FIGS. 6–9. Spores of the holotype of *Pelletixia amelguita*. FIG. 6. Detail of spores showing proximal face with trilete mark and raised lips, ×1600. FIG. 7. Proximal face of spore, ×2200. Note that lips join with muri and extend to the margin. FIG. 8. Spores in sporangium showing distal face with irregular polar triangle. Possible remnants of annulus may be seen at edges of photograph, ×940. FIG. 9. Isolated spore with polar triangle and detail of muri on distal face, ×2200.



FIGS. 10–12. Spores of the holotype of *Pelletixia amelguita*. FIG. 10. Cluster of spores showing variability of polar triangle, ×618. FIG. 11. Spore with tripartite polar triangle (one section occluded), ×1854. FIG. 12. Spore with spherical depression in the polar triangle, ×1854.

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